

## MATHEMATICS 360-255-LW

Quantitative Methods II

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# XXI – Inferences for Correlation

1. Sociability can be expressed in a number of different ways, including having a lot of friends and dating frequently. A researcher asked a sample twenty college students about how many good friends they have and how many dates they have had in the past month. Suppose a correlation coefficient of 0.41 was calculated.

- Construct a 99% confidence interval for the population correlation.
- Is the correlation significant at the 1% level of significance? Try with both approaches, the classical and the  $p$ -value.

2. A psychologist wishes to see if there is a link between depression and anxiety. For this, she chose 50 people at random and made them fill a test for depression and another one for anxiety. A correlation of 0.27 was calculated.

- Construct a 90% confidence interval for the population correlation.
- Is the correlation significant at the 10% level of significance? Try with both approaches, the classical and the  $p$ -value.

3. An urban sociologist interested in neighborliness collected data for a sample of 10 adults on how many years they have lived in their neighborhood and how many of their neighbors they regard as friends.

# of years	1	5	6	1	8	2	5	9	4	2
# of friends	1	4	2	3	5	1	2	6	7	0

- Construct a 95% confidence interval for the population correlation.
- Determine if the correlation is significant at the 5% level of significance. Try with both approaches, the classical and the  $p$ -value.

4. An article in the *Journal of Social Psychology* reported a linear correlation coefficient of  $-0.61$  between satisfaction with work scores and propensity to leave a job. Suppose this was based on a random sample of 250 Canadian adults.

- Construct a 99% confidence interval for the population correlation.
- Determine if the correlation is significant at the 1% level of significance. Try with both approaches, the classical and the  $p$ -value.

5. The following is a correlation matrix among family size, weekly grocery bill, and income for a random sample of 50 families.

	Family size	Weekly grocery bill	Income
Family size	1.00	0.60	0.20
Weekly grocery bill		1.00	0.30
Income			1.00

Which of the correlations are significant at the 5% level of significance? Use the classical approach.

## ANSWERS

1. a)  $-0.188 < \rho < 0.786$
- b)  $H_o : \rho = 0$  critical values:  $\pm t_{(18,0.005)} = \pm 2.878$  Fail to reject  $H_o$   
 $H_A : \rho \neq 0$  test statistic:  $t = 1.91$   
 $0.060 < p\text{-value} < 0.074$
2. a)  $0.037 < \rho < 0.475$
- b)  $H_o : \rho = 0$  critical values:  $\pm t_{(48,0.05)} = \pm 1.667$  Fail to reject  $H_o$   
 $H_A : \rho \neq 0$  test statistic:  $t = 1.94$   
 $0.052 < p\text{-value} < 0.064$
3. a)  $-0.019 < \rho < 0.898$
- b)  $H_o : \rho = 0$  critical values:  $\pm t_{(8,0.025)} = \pm 2.306$  Fail to reject  $H_o$   
 $H_A : \rho \neq 0$  test statistic:  $t = 2.22$   
 $0.050 < p\text{-value} < 0.058$
4. a)  $-0.703 < \rho < -0.497$
- b)  $H_o : \rho = 0$  critical values:  $\pm t_{(248,0.005)} = \pm 2.617$  Reject  $H_o$   
 $H_A : \rho \neq 0$  test statistic:  $t = -12.12$   
 $p\text{-value} = 0.000$
5. a)  $H_o : \rho_{fw} = 0$  critical values:  $\pm t_{(48,0.025)} = \pm 2.009$  Reject  $H_o$   
 $H_A : \rho_{fw} \neq 0$  test statistic:  $t = 5.20$   
 $p\text{-value} < 0.002$
- b)  $H_o : \rho_{fi} = 0$  critical values:  $\pm t_{(48,0.025)} = \pm 2.009$  Fail to reject  $H_o$   
 $H_A : \rho_{fi} \neq 0$  test statistic:  $t = 1.41$   
 $0.140 < p\text{-value} < 0.168$
- c)  $H_o : \rho_{wi} = 0$  critical values:  $\pm t_{(48,0.025)} = \pm 2.009$  Fail to reject  $H_o$   
 $H_A : \rho_{wi} \neq 0$  test statistic:  $t = 2.18$   
 $0.032 < p\text{-value} < 0.042$

Thus the correlations that are significant are between family size and weakly grocery bill and between weakly grocery bill and income.